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Notes on the petrified plants from Chile (1)****

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チリ産石化植物ノート (1)

Studies on petrified plants from the Tertiary of Chile have not progressed for about forty years since Kräusel (1925) described some species from Magallanes (Magellan) District and the Fuego Island. Since the first author visited Chile first in 1968 as a member of University of Tokyo Botanical Expedition to the Andes (chief: the late Dr. F. Maekawa) which were financed by a Grant-in-Aid for Overseas Scientific Survey from the Ministry of Education, Science and Culture, he has been interested in the petrified woods of Chile. More than twenty species of petrified woods have already been described by now (Nishida 1970, 1984a, b, c, d, Nishida & H. Nishida 1987, Nishida, H. Nishida & Nasa 1987). During field survey in Chile, the first author had collected trunks of Chilean living woods for comparative study with fossil woods. The third author was invited by the Ministry of Education, Science and Culture of Japan as a Foreign Research Student in charge of the anatomical study of these Chilean woods in the first author's laboratory. His Master's thesis was published in 1987 (Rancusi et al. 1987) financed by a Grant-in-Aid for Publication of Scientific Research Results from the Ministry of Education, Science and Culture. This monograph will be very useful for identifying petrified woods from the Tertiary of Chile. On the other hand, Chilean researchers represented by Mrs. Terresa Torres started to describe petrified plants from Chile and Antarctica (Torres 1981, 1984a, b, Torres & Rallo 1981, Torres & Godoy 1982, Torres, Valenzuela & Gonzalez 1981, 1982, Torres, Roman, Rivera & Deza 1984, Torres & Biro-Bagoczky

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1986). These works are undoubtedly going to add a new history for palaeobotany of Chile. Some of their works, however, include problems in the identification and taxonomic treatment, which are taxonomically misleading and will provide future confusion. In this paper we are going to point out these problems and add taxonomical and nomenclatorial revisions.

Taxonomic treatment

Nothofagoxylon menendezii Ragonese, Ameghiniana 14: 76 (1977). Nishida, Nishida & Nasa, Res. Inst. Evolut. Biolog. Sci. Rep. 3: 27 (1987). *Nothofagoxylon pichasquense* (original: pichasquensis) Torres et Rallo, Anals II Congr. Latino-Amer. Paleont. Brasil. p. 389 (1981).

Diagnosis of *Nothofagoxylon pichasquense* is very incomplete, lacking of descriptions of important characteristics such as pore density, ray-vessel pits and cellular constitution of rays. The diagnosis, therefore, does not fully represent characteristics of the genus *Nothofagoxylon*. The characteristics of *Nothofagoxylon pichasquense* can be described as follows: perforation plate exclusively simple; intervessel pits small, circular and arranged either oppositely or alternately; vessels with abundant tyloses, devoid of spiral thickenings; rays usually biseriate, sometimes uni- or triseriate, and heterogeneous type II-A of Kribs, 3-20 cells high or up to 500 μm in height. Diagnostic characters mentioned above matches well with those of *Nothofagoxylon menendezii* Ragonese (1977) from the Tertiary of Rio Negro, Argentina and *N. pseudoobliquum* Nishida (1984d) from the Tertiary of Quiriquina Island, near Concepción, Chile. *N. menendezii* has circular to elongate ray-vessel pits, while *N. pseudoobliquum* has scalariform ones. Moreover, *N. menendezii* has spiral thickenings on vessel walls and crystals in ray cells. *N. pichasquense* lacks spiral thickenings of vessel walls and crystals in ray cells, both of which occur in *N. menendezii*. The both features are flexible as diagnostic characters, because their presence depends on the status of preservation. Judging from the original figure of radial section of *N. pichasquense*, we believe it highly possible that the specimen lacks scalariform ray-vessel pits. This leads us to regard *N. pichasquense* as being synonymous with *N. menendezii*.

Locality. Pichasca, Provincia Ovalle.

Horizon. Upper Cretaceous.

Distribution. Patagonia; Chiloe Island.

Laurinoxylon uniseriatum Gothan, in Nordenskihold (ed.), Wiss. Ergebn.

Schwed. Sudpol. Exped. 1901-1903, 3: 16 (1903). *Nothofagoxylon boureaui* Salard, Rev. Gen. Bot. Paris, 68: 260 (1961). Nishida, H. Nishida & Nasa, Res. Inst. Evolut. Biol. Sci. Rep. 3: 25 (1987). *Salicinoxylon serrae* Torres, Valenzuela et Gonzalez, Anals II Congr. Latino-Amer. Paleont. Brasil. p. 453 (1981).

Salicinoxylon serrae Torres et al. (1981) from the Tertiary of Chiloe Island has simple perforation plates, alternately arranged circular and hexagonal intervessel pits, heterogeneous uniseriate rays and ovoid ray-vessel pits which are arranged in 2-7 rows. The rays are rarely biseriate in part, and reach 27 cells or 875 μm in height. There is no description by Torres et al. (1981) regarding pore density and the ratio of solitary and multiple pores, but the figure of cross section shown by them (Lamina I, A) is similar to those of both *Laurinoxylon uniseriatum* Gothan (1908) and *Nothofagoxylon boureaui* Salard (1961). The radial section of *Salicinoxylon serrae* is so small and lacks details of the shape and arrangement of ray-vessel pits. Ray-vessel pits of *Salix* are hexagonal or polygonal in shape, and alternately and contiguously arranged, while *Salicinoxylon serrae* has oval pits which are arranged in 2-7 rows (see description of Torres et al. 1981). This suggests that *Salicinoxylon serrae* can be allied not to *Salix* but to *Nothofagus* or other genera. In our opinion, the description of *Salicinoxylon serrae* Torres et al., as quoted above, well coincides with those of *Laurinoxylon uniseriatum* Gothan (1908) and of *Nothofagoxylon boureaui* Salard (1961). The figures of *Salicinoxylon serrae* by Torres et al. (1981) also match to those of the latter two species. In *Salicinoxylon serrae* the rays are rarely biseriate in part. This is also the case in the specimens of *Laulinoxylon* from the Fuego Island (Nishida, H. Nishida & Nasa 1987). *Saliciaoxylon serrae* is, therefore, synonymous with *Laurinoxylon uniseriatum*. As for systematic treatment of this species, see also Nishida, H. Nishida & Nasa (in press).

Locality. Teguaco hills, Chiloe Island.

Horizon. Tertiary.

Distribution. Cerro Dorotea, Ultima Esperanza; Fuego Island; Santa Cruz, Argentina; Seymour Island, Antarctica.

Laurinoxylon ruei (Salard) M. Nishida, H. Nishida & M. Rancusi H., comb. nov. *Nothofagoxylon ruei* Salard, Rev. Gen. Bot. Paris 68: 245 (1961). Nishida, H. Nishida & Nasa, Res. Inst. Evolut. Biol. Sci. Rep. 3: 25 (1987).

Nothofagoxylon ruei was described by Salard (1961) based on the specimens from Cerro Dorotea, Ultima Esperanza. She described *N. boureaui* at the same

Tab. 1. Comparison of diagnostic characters between *Laurinoxylon uniseriatum*

	Pores (vessels)			
	Disposition	Tangential diameter	Density	Intervessel pits
L. uniseriatum	diffuse, semicircular: solitary, 2-6 in multiple	30-140 μm* (radial) 26-99 μm** 19-117 μm***	65-90*, 110-117**, 86-141*** per sq. mm	polygonal, circular, elliptical; alternate
S. serrae	diffuse; solitary, 2-4 in multiple	35-215 μm	27-64 per sq. mm	hexagonal, circular; alternate

*: by Kräusel (1925), **: by Salard (1961), ***: by Nishida et al. (1987).

Tab. 2. Comparison of diagnostic characters between *Nothofagoxylon*

	Pores (vessels)			
	Disposition	Tangential diameter	Density	Intervessel pits
N. scalariforme	diffuse, semicircular; solitary, 2-4 in multiple	25-60 μm*	60-120 per sq. mm*; 30-75 per sq. mm	scalariform, sometimes circular, polygonal; opposite
N. antarcticum	diffuse, semicircular; solitary, 2-4 in multiple	34-180 μm	27-64 per sq. mm	circular; opposite; scalariform in thin vessels

*: by Kräusel (1925).

Gothan (1908) and *Salicinoxylon serrae* Torres et al. (1981).

	Rays			Wood parenchyma
Perforation	Width	Height	Ray-vessel pits	
simple, scalariform in thin vessels	uniseriate, rarely biseriate in part	7–15 (4–19***) cells high**, 110–500 (72–797***) μm in height**	circular	diffuse
simple	uniseriate, rarely biseriate in part	5–27 cells high, up to 875 μm in height	circular	diffuse

scalariforme Gothan (1908) and *N. antarcticum* Torres (1984).

	Rays			Wood parenchyma
Perforation	Width	Height	Ray-vessel pits	
simple; often scalariform*	uniseriate sometimes biseriate	up to 20 cells high; 3–16 cells high*	scalariform, elliptical	apotracheal? crystals
simple; scalariform in thin vessels	uniseriate sometimes biseriate	7–13 cells high; 166–349 μm in height	elliptical, scalariform	apotracheal, diffuse lacking crystal

time. *N. ruei* is distinguished from *N. boureaui* by only one diagnostic character: the former has 30% biseriate rays, while *N. boureaui* has exclusively uniseriate rays. In this and all other characteristics *N. ruei* is like *Laurinoxylon* and should be placed in synonimy with it.

Horizon. Tertiary: Oligocene-Miocene.

Distribution. Patagonia: Ultima Esperanza, Fuego Island.

Nothofagoxylon scalariforme Gothan, in Nordenskihold (ed.), Wissensch. Ergebn. Schwed. Südpol. Exped. 1901-1903, 3: 20 (1908). Krausel, Ark. Bot. Svensk. Vetensk. 19: 19 (1925). Nishida, H. Nishida & Nasa, Res. Inst. Evolut. Biol. Sci. Rep. 3: 25 (1987). *Nothofagoxylon antarcticum* Torres, Memoria III Congr. Latinoamer. Paleont. p. 558 (1984).

Nothofagoxylon antarcticum Torres (1984b) is based on the petrified wood from the Tertiary of Rey Jorge Island, Antarctica. It has diffused porous wood, with tendency to have semicircular arrangement of pores. Its anatomical features are illustrated as follows. Pores solitary (28-40%) or 2-4 in multiples (60-72%), with low density, 27-64 per square mm. Perforation plates simple or in thin vessels scalariform. Intervessel pits circular, and scalariform in thin vessels. Ray-vessel pits horizontally elongated elliptical or scalariform (see Torres 1984b, Lamina 1, 5). Rays usually uniseriate, sometimes biseriate, homogeneous or heterogeneous type III and type II-B of Kribs, and 7-13 cells or 116-349 μm in height. Wood parenchyma apotracheal diffuse type. According to the original description, *Nothofagoxylon antarcticum* is very similar in general morphology to *Nothofagoxylon scalariforme* Gothan from the Upper Cretaceous of Seymour Island, Antarctica and the Tertiary of Cerro Prat, Provincia Magallanes, Chile (see Tab. 2). *N. antarcticum* and *N. scalariforme* can only be separable using difference in numerical values such as pore density etc. Judging from the anatomy of living woods, such numerical differences between *N. antarcticum* and *N. scalariforme* seem to be included in a wide variation range within the same species and are so inconsistent as to be used as diagnostic characters.

Undoubtedly the pore density of *N. antarcticum* is lower than that of *N. scalariforme*. This seems to be more significant diagnostic character. In the case of *Nothofagoxylon krauseli*, however, the specimen from the type locality (Cerro Dorotea, Ultima Esperanza) dominantly has solitary pores (50-66%), while the specimen from the Fuego Island mainly has pores in multiples

(57-66%). Moreover in living *Nothofagus* species the pore density is variable within the same species; for example, the pore density of *Nothofagus betuloides* varies much, e.g. 150-250 pores per square mm (Wagemann 1949), 200-300 (Tortorelli 1956), and 400-600 (Rancusi et al. 1987). Pore density is, therefore, not always a significant diagnostic character, and this seems to be the case in connection with *Nothofagoxylon antarcticum* and *N. scalariforme*. *N. scalariforme* has crystals in wood parenchyma, while *N. antarcticum* lacks them. Crystals, however, seem to be not always a stable diagnostic character, for their preservation depends on the degree of petrification. *N. scalariforme* usually has scalariform and rarely circular bordered pits as intervessel pittings, while *N. antarcticum* usually has oppositely-arranged circular pits and in thin vessels scalariform pits. Tangential diameters of vessels are 34-180 μm in *N. antarcticum* and 25-60 μm in *N. scalariforme*. It is natural to consider that *N. scalariforme*, which has thinner vessels, has scalariform intervessel pittings. For this reason *N. antarcticum* is regarded to be synonymous with *N. scalariforme*.

Locality. Rey Jorge Island, Antarctica.

Horizon. Upper Cretaceous and Tertiary.

Distribution. Antarctica and Patagonia (Cerro Prat, near Punta Arenas)

On Cupressinoxylon chilensis Torres (1981)

The scientific name of *Cupressinoxylon chilensis* Torres appeared first in a short note summarizing a paper read in the annual meeting of the Biological Society of Chile. It is entitled "Estudio anatomico de *Cupressinoxylon chilensis* n. sp., madera fossil Terciaria de Chile". Only four lines of sentences mentioning the width of annual rings can be regarded to be descriptive in this note. It does not have any figure. Though the diagnostic characters of *C. chilensis* appeared in the table comparing it with *Cupressinoxylon parenchymatosum* (Torres, Roman, Rivera & Deza 1984), any figure did not published. This is againsts the arcticle 38 of the International Code of Botanical Nomenclature (ICON, 1983). We can not accept *C. chilensis* to be validly published.

On Myrtoxylon pichasquensis Torres et Rallo (1981)

Torres & Rallo (1981) designated this as a new species based on the specimens from the Upper Cretaceous of Pichasca, Ovalle. This appeared in a short article with rather invalid description. The features of this species are circumscribed that pores are exclusively solitary, perforation plates are usually

simple and sometimes scalariform, rays are heterogeneous, uni- and biseriate and 4-11 cells high and up to 550 μm in height, and parenchyma is apotracheal and diffuse. The description lacks some important diagnostic characters such as features of intervessel pittings and ray-vessel pits, cellular constitution of rays and the number of cross bars in scalariform perforations. It seems to be difficult for use to assign the specimen to the Myrtaceous woods based on the diagnostic features provided by Torres et al. Multiseriate rays with uniseriate margins are one of the most important diagnostic characters of the Myrtaceae, especially of *Myrceugenia*, *Myrceugenella* and *Laurelia*. Judging from the figures of vertical sections of *M. pichasquensis*, their specimens look too badly preserved to examine ray-vessel pits. It is undesirable to describe new species based on such a badly preserved specimen. We, therefore, tend to regard *Myrtoxylon pichasquensis* to be illegitimate.

On Elaeocarpoxylon pichasquensis Torres et Rallo (1981)

This species was described by Torres and Rallo based on the specimen from the Upper Cretaceous of Pichasca, Ovalle. It has 2-8 pores in multiples, simple perforation plates, circular intervessel pits, heterogeneous multiseriate, mostly triseriate, rays, septate wood fibres and paratracheal wood parenchyma. There is no description on ray-vessel pits, even pore density and cellular constitution of rays. This makes us difficult or impossible to compare it with other fossil and extent species and to consider its systematic position. It may leave a great confusion in the future if this species, illustrated by such an insufficient description, is regarded being validly published. To omit future taxonomical confusion we do not further discuss about *Elaeocarpoxylon pichasquensis*. Although Torres & Rallo (1981) did not describe cellular constitution of rays, judging from their figure of tangential section, multiseriate rays of *Elaeocarpoxylon pichasquensis* lack unicellular wings which are important diagnostic characters of *Elaeocarpoxylon* Prakash et Dayal (1964) including *E. sloaneoides* Petriella (1972) and of Chilean elaeocarpaceous woods, *Aristotelia* and *Crinodendron* (Rancusi et al. 1987). *E. pichasquensis* resembles *Aristotelia* and *Crinodendron* in pore arrangement in cross section, but it differs from the latters in having multiseriate rays without uniseriate wings. It is evident that *E. pichasquensis* lacks features characteristic of the Elaeocarpaceae. The true affinity of *E. pichasquensis* still remains uncertain before detailed description and more careful comparison with both living and fossil species are provided.

Thus *E. pichasquensis* does not belong to the Elaeocarpaceae nor *Elaeocarpoxylon*.

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チリ・パタゴニア産の材化石の研究は Kräusel (1925) 以後，西田 (1970) が再開するまで中断されていた。西田 (1984) 及び西田ら (1987) によってすでに20種ほど記載されている。いっぽう，チリでも Torres 女史により，南極を含めてチリ産の珪化木の記載が開始されている。しかし，それらの記載には不完全で実体のつかめぬ種，既知の種・属との対比が充分でない種，命名規約違反などがあり，将来混乱を招来すると思われるので，今回それらを明かにし，学名を整理した。

Nothofagoxylon pichasquense Torres et Rallo (1981) は道管・放射組織間膜孔の記載を欠き，かつ写真も不鮮明で，その正体は不明であるが，アルゼンチン産の *N. menendezii* Ragonese (1977) かチリ，キリキナ島産の *N. pseudoobliquum* Nishida (1984) かの何れかであるが，写真より判断して，前者と思われる。*Nothofagoxylon antarcticum* Torres (1984) は道管の直径が大きく，したがって分布密度が小さい点を除けば *N. scalariforme* Gothsn (1908) に一致する。チロエ島から報告された *Salicinoxylon serrae* Torres et Godoy (1981) はすでに南極及びチリ・パタゴニアから知られている *Laurinoxylon uniseriatum* Gothan (1908) にほかならない。*Cupressinoxylon chilensis* Torres (1981) の原記載はチリ植物学会の講演要旨にたった4行，年輪幅が記載してあるだけで，組織学的記載は全くない。また図を欠いている。これは古植物命名規約38条に違背する。*C. chilensis* は無効名である。*Myrtoxylon pichasquensis* Torres et Rallo (1981) と *Elaeocarpoxylon pichasquensis* Torres et Rallo (1981) は共に記載が不充分で，その正体は明かでないが，写真から判断して放射組織に単列の翼を欠くという重要な特徴により，それぞれ *Myrtoxylon* と *Elaeocarpoxylon* に属さぬばかりでなく，Myrtaceae, Elaeocarpaceae にも属さない。

□**長野県植物研究会誌第20号(創立20周年記念号)** 165 pp. 1987. 長野県植物研究会(松本市旭3-1-1 信州大学教養部生物学教室内)．¥3,500(送料¥90)．長野県植物研究会は創立20周年をむかえた。長野県は広大なうえに，もともと各地の研究活動が活発なところであるが，それ故に一つにまとまって会を運営するには，役員のなみなみならぬ努力と，会員の協力が必要だったろう。その成果として，同会は一地方同好会の域をこえて，全国的な賛同を得るに至っている。このことはこの記念号を見ても察せられる。会員の寄稿20篇のほか，特別寄稿15篇は日本の植物学界の現況を概観するに足る広汎な領域をカバーしている。このほかに短報14篇とこれまでの全号の著者名索引，短報索引がある。
(金井弘夫)

□韓国植物研究所(編)：**李永魯文集** 211pp. 1986. 同研究所，Seoul. 非売品．梨花女子大学教授李永魯氏の停年を記念して，同氏の学術論文以外の小文を集成した紙上植物記と，世界各地への旅行メモ世界植物採訪記より成る。巻末に履歴と論文目録があり，韓国の植物分類学の傾向の一端を知るに足るものである。全文韓語。　(金井弘夫)

□李永魯 (Lee, Yong Noo)：**韓国産松柏類** 241 pp. 1986. 梨花女子大学出版部, Seoul. 5,000 Won. 内容は概説，分布，形態，染色体，各論（種の検索表を含む），生態，害虫，古典・天然記念物，雑録より成る。各論は種の検索表を含む。文献表および索引がついている。全文韓語。　(金井弘夫)